Phil Atwater, Jim DeHaan, Lori Rux, and Malin Jacobs

FY 1999 - FY 2001

The Power System Diagnostics Research Project is formulated from the demonstrated problem areas in Reclamation electrical facilities and by the research-oriented requests of project personnel. The program focuses on improving the reliability, efficiency, and safety of Reclamation facilities and the associated interconnected electric power system. The project tasks are multi-faceted and evolve to solve repetitive problems or needs that are common Reclamation-wide.

Specific objectives for FY 1999 were as follows:

- Investigate and develop improved methods for testing and assessing the condition of high-voltage insulation of large motors and generators (partial discharge analysis [PDA] and high-voltage ramp test set).
- Develop test methods and equipment to field test a prototype pulsed-current test set for safety grounding cables.
- Advance the design of the in-house fabricated fiber-optic air-core current transformer (CT) field testing instrument for commercialization.
- Secure a modern, bug-free Electromagnetic Transients Program (EMTP) software for world-wide power systems design, analysis, and diagnostics.
- Develop safe work procedures for large generator rotor turning safety gear.
- Commercial PDA test equipment was installed on one large generator, and measurements have been made and evaluated at three plants.
- Completed evaluation of electromagnetic interference technique for measuring electrical discharges in insulation at Grand Coulee.
- A new CRADA partner has been identified for reviving the commercialization of our ramped, high-voltage insulation test set.
- Rotor-mounted scanner solicitation and contractor bid was reviewed for equipment installation on Grand Coulee unit G7.
- Air core CT has been integrated into laser-powered measuring instrument, demonstrated at Mt. Elbert Powerplant, and incorporated for commercial production by two private companies.
- Personal safety ground cable high-current pulse test method was

successfully automated, showing possible advantage for the detection of defects in the ground cable components.

- A tunnel communication test with 10-GHz radio equipment provided very favorable results.

- Drawings and specifications for electric-powered rotor turning safety gear were prepared for construction, testing, and permanent use at Glen Canyon Powerplant.

- Root cause analysis of San Luis Unit 5 pump/generator catastrophic failure was performed, providing valuable information for development of Reclamation root cause application guide.

- Phase 2 of the global Electromagnetic Transients Program (EMTP) software restructuring effort is underway. There are now over 1,240 licensees using the program throughout the world. The Egyptian Electrical Authority, Entergy, and Power Link Australia are some of the more recent new licensees.

Grand Coulee, Davis, Glen Canyon, and Yellowtail Powerplants; High Current Technologies, Inc.; and Interoptix, Inc.

Atwater, Philip L. and James M. DeHaan. 1999. Staged Fault Test Evaluation of High-Voltage Equipment Maintenance Safety Grounding at a Large Hydro-Electric Powerplant. IEEE Summer Power Meeting.

DeHaan, James M. 1999. Efficiency Test Results of a 46-Year-Old Synchronous Motor, Rotating Electric Machinery Colloquium.

Rux, Lori M. 1999. Rehabilitation of Flood-Damaged Hydroelectric Generators. International Electric Machines and Drives Conference.

Rux, Lori M. 1999. Detection of Delaminated Stator Winding Insulation Using the Ramped High-Voltage DC Test Method, Eleventh International Symposium on High-Voltage Engineering.

Prototype air-core current transformer installed for 6-month demonstration at Mt. Elbert Powerplant. Patent application filed. Technology transfer initiated to two private companies.